Tools for Creating Learning Environments

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Abstract: - Open source software gives the secondary and college instructors the flexibility to design/produce teaching modules with their own pedagogical approach. Finding the right tool is the first and most difficult task for novice instructors who want to produce their own teaching modules. This paper aims to provide a comparison between two open source software: eXelearning – an XHTML editor – and Xerte Online Toolkits – an eLearning authoring software. This paper gives recommendations for mathematics instructors.

Key-Words: - open source authoring tool, e-Learning, eXelearning, Xerte Online Toolkits, online teaching

1 Introduction

The production of effective e-learning materials relies on the availability of tools that support authors, both in designing and building content [7], and the choice of a specific authoring tool has a significant impact on the final quality of e-learning products [1]. But there is a more significant practical condition to consider. Most secondary and college instructors do not have the technical skills for web publishing, and they rely on the availability of web developers to produce teaching modules mostly.

Many free, open source authoring tools offering the chance to produce interactive multimedia without programming skills have been developed to overcome this situation, for example, eXelearning [14], Xerte Online Toolkits [15], Xical [16], Multimedia Learning Object Authoring Tool [17], etc.

According to GNU project's freedom statements, open source (OS) software is free to 1) run the program, for any purpose; 2) study how the program works, and adapt it to your needs; 3) redistribute copies so you can help your neighbor; and 4) improve the program, and release your improvements to the public, so that the whole community benefits. But we believe that the easiness to use (or even start with) is one of the most important factors for instructors and educators in the teaching field [18].

The goal of this paper is to present the comparison of two authoring tools, eXelearning and Xerte, for mathematics instructors, and to show which one is good for novice instructor and for school-wide use of such tool. One of the main concerns for such recommendation relies on how easily mathematical symbols and equations can be produced and expressed with the tool.

2 eXelearning

The eXelearning is a web-based authoring tool designed to assist instructors in the design, development and publishing of web-based learning and teaching materials without the need to become proficient in HTML, XML or complicated web-publishing applications. The eXelearning can generate interactive contents in XHTML or HTML5 format, and allow to create navigable web pages, including text, images, interactive activities, image galleries or multimedia clips. These files can be exported in different digital formats, to be used independently in instructor's website or to integrate them into school's Learning Management System (LMS).

The outline pane of eXelearning's graphical user interface will show a tree diagram to build the course and can show an outline that reflects their own preferred hierarchical structure and taxonomy, i.e. topics > sections > units, or parts > chapters > sections, etc.

2.1 Instructional Devices (iDevice)

The user can place the content at any level, and the content is any of a list called iDevice, the main instructional device in the eXe. Each iDevice is a collection of structural units that describe learning content and activities and is the main feature of eXelearning that serve as templates of learning content such as Cloze Activity, Multi-

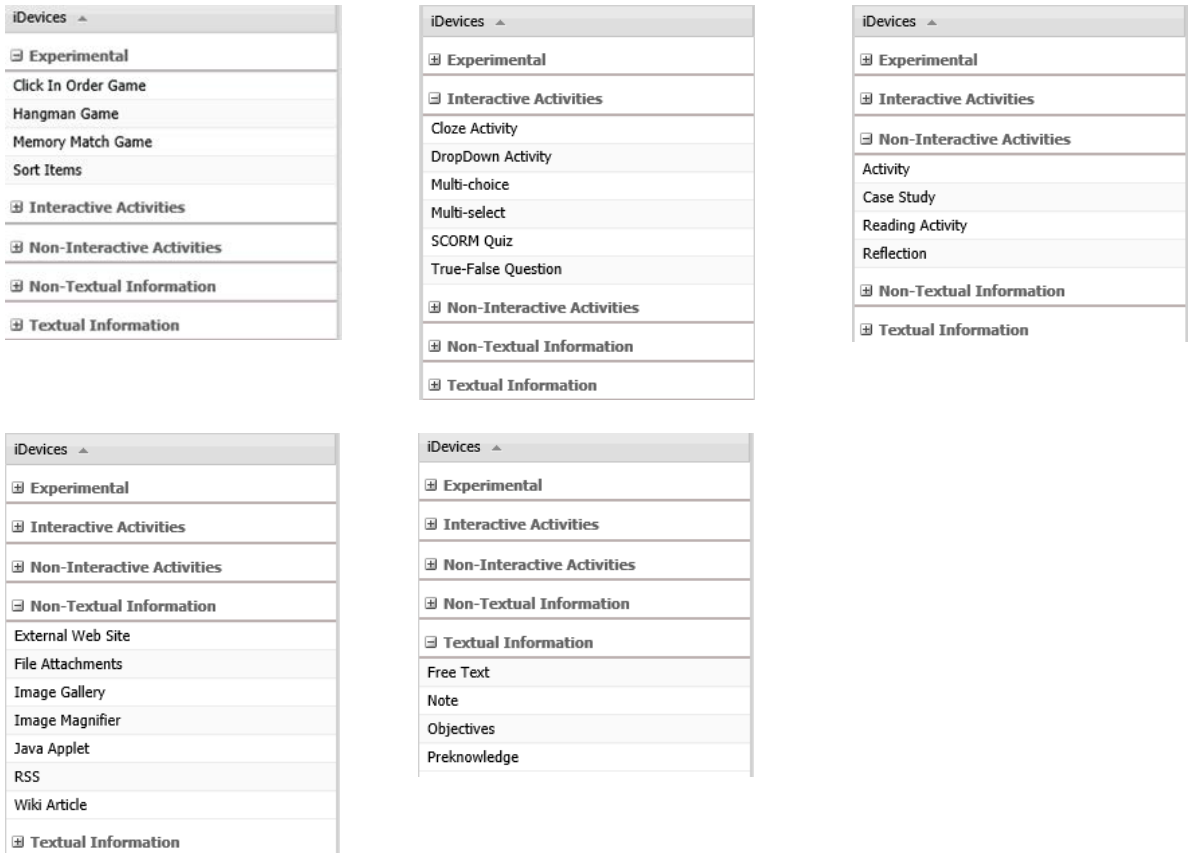

Fig. 1: iDevices in eXelearning

choice/selection, External Web Site, Java Applet, SCORM Quiz, Wiki article, etc. (Fig. 1). Each iDevice comes with assistance for users in the form of 'Pedagogical Tips' around the inclusion of iDevices. These tips can help users make informed decisions around when and how to use iDevices for delivering course material. Tips are also provided near each iDevice's form field to assist users in generating appropriate content. The eXelearning comes with the iDevice Editor in the Tool menu. Using the iDevice Editor users can create and archive new customized iDevices of their own. The following are features of some useful iDevices.

The Cloze Activity iDevice prompts learners with a piece of text with significant phrases or words missing. Learners demonstrate their knowledge and understanding of the concepts presented in the text by filling in the missing phrases or words. This is a useful device for testing reading comprehension and language skills.

The Activity iDevice provides a clean slate to define a task the student must complete. The instructor can provide information that will help the students in fulfilling the given task, making sure to consider obstacles that the students might face.

The Multi-choice/selection iDevices can be used as a self-testing tool to bring about discussion and thought on topics that students might be reluctant to respond to. This iDevice is quite interesting because instructors can include feedback to each option available stating whether the answer is correct or incorrect and the reasons why a response is correct or not.

The External Web Site iDevice allows instructors to attach an external website URL to the content. This feature allows learners to browse the external website without the need to open a new browser window.

The SCORM Quiz iDevice bundles questions to form a quiz assessment. This assessment is then managed by the LMS to enable scoring.

The True-False Question iDevice present a statement that requires the learner to make a determination whether the statement is true or not.

The wiki article iDevice takes a snapshot of an article and embeds it into the eXelearning content. This iDevice requires that the author be connected to the internet. Changes made to the article will not automatically be updated to a Wiki so changes made on your local machine to the wiki content in your content should be submitted back to the wiki where appropriate.

The Java applet iDevice allows users to load a simple java applets into the eXelearning content.

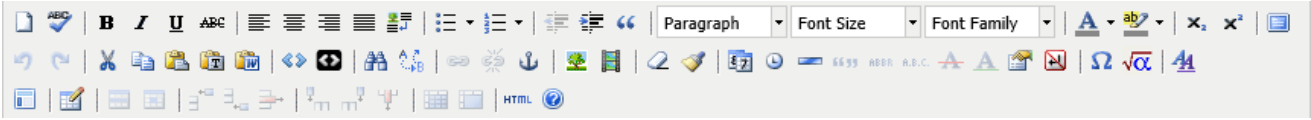

Fig. 2: Rich Text Editor

This iDevice also recognizes Descartes, GeoGebra, JClic, and Scratch as an applet format. Since the recent change of GeoGebra program, it is recommended to use External Web site iDevice to use GeoGebra files from the GeoGebra tube (See http://tube.geogebra.org/). This can serve as a tool to provide students with visual and interactive resources to solidify topics learned that couldn't be expressed with a chalkboard.

2.2 Rich Text Editor

Using the iDevice rich text editor users can enter the content as they would if they were using standard word processing type applications. The editing toolbar located above each editable frame provides some basic formatting, searching and linking functionality. Formatting content is relatively simple, especially embedding images, videos, and mathematical equations (Fig. 2).

The following media types can be embedded into almost all iDevices: HTML5 video (ogv/ogg, webm, mp4, wave), Flash (swf, flv, mp3), QuickTime (mov, mpeg), Windows Media (wmv, wma), Real Media (ram), and iframe. All of these media types may require additional browser plugin support. Each of these different media types has their own set of attributes, available within the media dialog's Advanced tab. The program that we would like to recommend for creating lecture videos are Jing and Camstudio. Both of them are free software that can record onscreen activity and sound with the use of a microphone, and save it as an swf (GeoGebra) file or an Avi, MP4, Flash file (Camstudio). This is very convenient because eXelearning can include this file as it is without converting it to any other format.

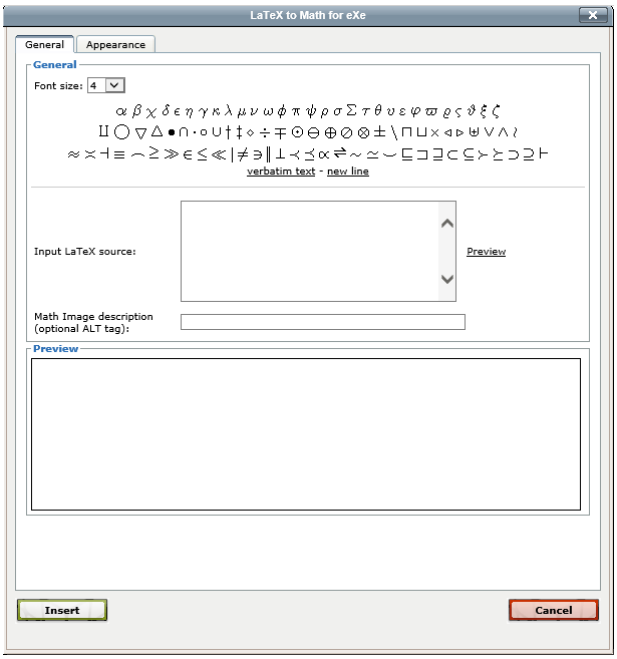

Fig. 3: Math editor

The eXelearning math image icon $\sqrt{\alpha}$ opens the eXelearning Math editor window, and users can use LaTeX commands to create and include mathematical equations almost everywhere within the content in any rich-text field. The equations are imbedded as image representations of what was generated through LaTeX. This is very convenient for users because it offers a much easier document mark-up language than HTML and XHTML (Fig. 3).

2.3 Exporting

The content created in eXelearning can be exported as a web package ready for publishing to a web server. Some of the export types are Single Web Page suitable for printing, a plain text file for display on mobile devices, or iPod Notes files. One of the most important features of eXelearning is that it can be exported as a self-contained website utilizing the navigational sequencing created during authoring and can be uploaded to a web server.

Two important export types are SCORM (Shareable Content Object Reference Model) 1.2 or IMS (Instructional Management Systems) content packages that can then be imported into an LMS, especially for self-grading purposes, such as Blackboard, WebCT, and Moodle (Fig. 4).

3 Xerte Online Toolkits

Xerte Online Toolkits (XOT) is free and open source eLearning authoring software, which is aimed at users who need a rapid authoring tool that can easily be used to create media-rich, interactive and highly accessible content without needing to know any of the underlying technology

The template-driven nature of the XOT is designed to be an easy way for instructors who are novice to eLearning authoring tools to create interactive learning objects which are accessible to students. As XOT is browser-based users don't need to know any Flash, html or other coding language to

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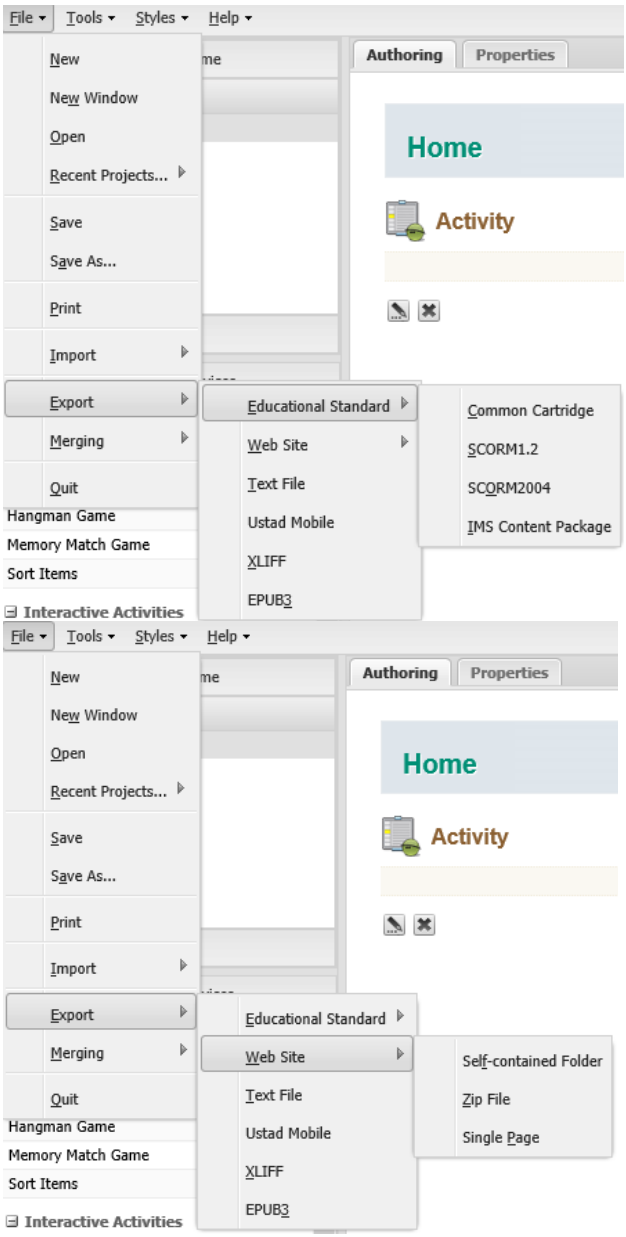

Fig. 4: Exporting formats

quickly create learning objects that can contain a mixture of text, images, audio, video, quizzes and other interactive content. The first (and maybe the most difficult) challenge for users who use XOT first time is the installation of the program. It is possible to install the XOT on a standalone computer (supporting PHP and MySQL) by using third party software to provide the functionality normally provided by a web server (XAMPP). To get and install the program, XAMPP should be installed first.

Some of the most important features we think to design a teaching module (especially for mathematics course) are: 1) Video, Picture, Graphs-Table and Audio compatibility, 2) LaTex compatibility, 3) Flash Animation, and 4) Embedded Interactivity. The XOT has a way to incorporate all of the above and plenty more. The figure above shows the main sub-categories included in the XOT. These sub-categories can be used by the instructor to plan and deliver the lesson.

3.1 Multimedia applications

The XOT supports current multimedia applications such as Flash Animation, Flash Paper, and videos among others (See Fig. 5 & 6).

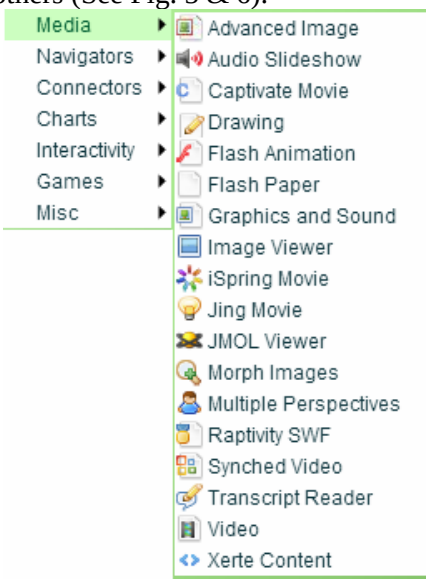

Fig. 5: Media sub-Category

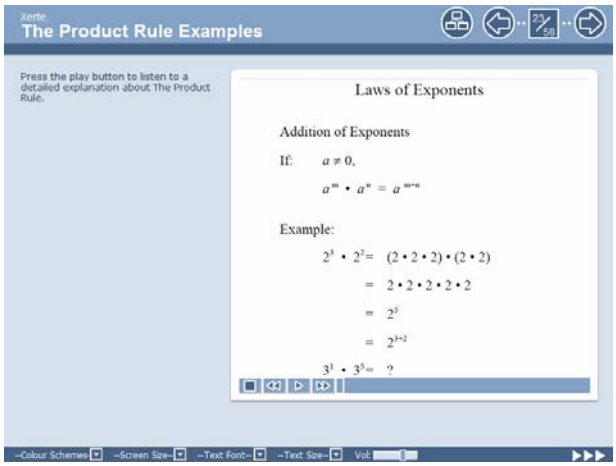

Fig. 6: example of lecture video

The Table 1 shows some of applications we had experienced with while working with the XOT. We had a difficulty to handle Flash file and Audio slide show for some reason we couldn't find out. It seems that a very good percentage of the applications are currently being supported without any major problems.

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Table 1: Multimedia Applications

Application	Difficul ties	Application	Difficul ties
Audio (mp3)	Easy	Font size	Easy
Pictures (jpg)	Easy	Quiz	Easy
Youtube video	Easy	Audio Slide Show	Medium
GeoGebra	Easy	Hyperlinks	Easy
Flash	Medium	Captivate Movie	Easy
Jing	Easy	Wikipedia article	Easy

3.2 Interactivity

The XOT offers multiple ways for the users to interact with the project through 'Interactivity.' It is mainly for student oriented hands-on activities. Matching Texts, Quiz, Timeline/Matching Pairs, Button Sequence, and Multiple Choice Questions among others are very useful tools for the instructional purposes (Fig. 6).

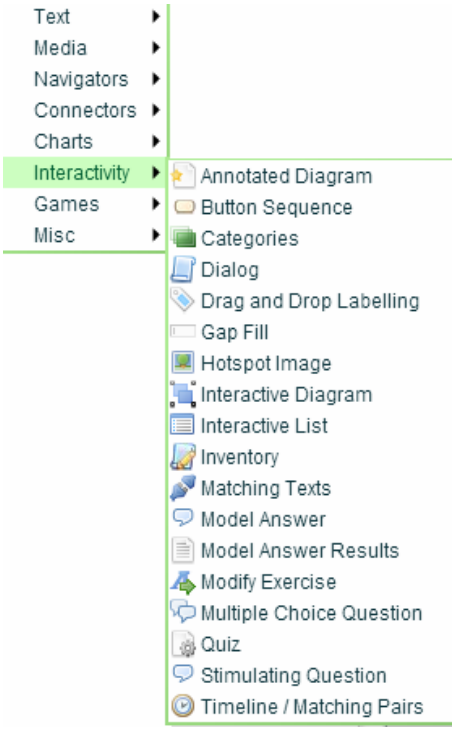

Fig. 6: Interactivity

The XOT accepts LaTeX commands except choices of multiple choice questions. That is, the user can use LaTeX commands to produce mathematical symbols and expressions in a regular text mode. But, in the choice of multiple question, the program does not provide a way to put LaTeX commands in it (Fig. 7).

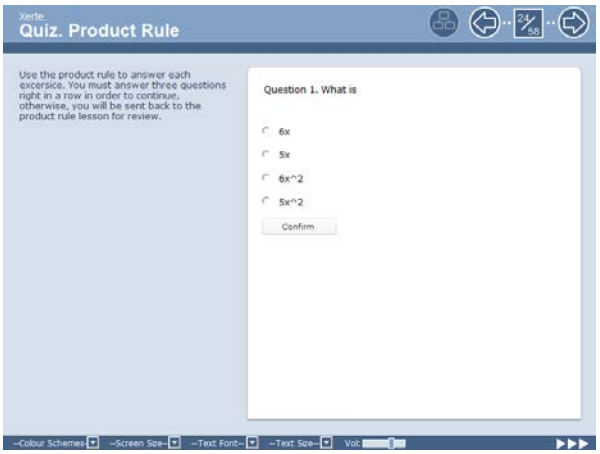

Fig. 7: example of multiple choice question

3.3 Connector

Connector pages are used for setting up the connection between pages in the XOT file.

One of the options in the learning object in page templates is 'Historic' for the navigation attribute. Selection of 'Historic' will provide a 'Home' button which takes the user back to the first page of the project and a 'Back' button that takes the user back to the previous page visited rather than to the previous page in the project sequence. Each page has navigation buttons which allow the project author to define which navigation buttons are enabled/disabled when that page is displayed to the user. The user can select text within a text field and create a page link by right clicking on the selected text and choosing 'Page Link' from the context menu, which enables any page to operate as a connector page.

The multiple choice connector page allows the user to define a question with a number of options as answers. A connection to another page is defined for each answer option.

3.4 Templates

The XOT comes with several 'page types' as templates, which can be chosen for creating a project. A preview and summary are provided within the project editor window for each page type.

The category page type allows the user to add a 'drag items to categories' interaction easily. The Drag and Drop Labelling page type allows the user to create drag and drop interactions. The Hotspot Image page type which allows you to add hotspots to images. The Multiple Choice Question template which enables you to add a multiple choice question anywhere within your learning object. You can add one or more individual pages containing a single multiple-choice question. You can create a simple true/false or single correct answer question or a more complex question with multiple correct

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answers. The various Navigators page types which provide different means of displaying information on the same page in smaller and/or separate chunks. The Timeline/Matching Pairs page type which allows you to add a 'drag items to correct sequence or to match pairs' interaction extremely quickly and easily.

The pages created are fully accessible, enabling the drag and drop interaction to be navigated and completed by keyboard without the need for a mouse.

4 Conclusion

Xerte Online Toolkits is developed by the University of Nottingham. The tool has an active developer community and has been the recipient of national and international awards. The eXe XHTML editor was originally developed in New Zealand, in 2007, and supported by the New Zealand government. The project remained active until 2010. In 2009-2010, the Instituto de Tecnologías Educativas del Ministerio de Educación del Gobierno de España (now INTEF) decided to restart and evolve the project, and gave a new name, eXelearning. The eXelearning evolved as a web development, web application or tool that can be used with the default or preferred browser of the user, capable to work, or to be executed, in different browsers.

Not like most content management systems, both programs, XOT and eXelearning:

- Are developed as an offline authoring tool without the requirement for internet connection.
- Provide an intuitive WYSIWYG environment, so the user can see what their content will look like in a browser when published.
- Provide professional web-publishing capabilities, so the user can import the file into a learning management system such as the Blackboard and Moodle.

By comparing these two programs as authoring tools for producing teaching modules we found that the eXelearning is really simple to start with. Since it is easy to install, a novice user can start using it without any difficulty. The XOT comes with many templates and features (at least more than the eXelearning has). When the eXe XHTML editor (previous version of the eXelearning) were introduced to a couple of groups of high school mathematics teachers pursuing MS in mathematics degree at the University of Texas at Brownsville, they could catch up the program fast and produce their own teaching modules easily. Since there was a period that the eXe XHTML editor program looks abandoned and no update, we had to introduce the XOT to our students. It was not an easy task for the instructor and the students.

The XOT comes with more features for producing different student's activities and for professional looking than the eXelearning can offer. But we found that the installation and setting of the program into a computer is extremely difficult for an ordinary instructor. It also requires longer time to get used to, since it comes with more complicated setting conditions if one wants to use the attached features to make teaching module looks more professionally. It also requires an improvement on using LaTeX commands.

We recommend the eXelearning for instructors who want to use an authoring tool first time. It is really user friendly and easy to install and use. It requires a very short learning curve to get used to. We believe that the XOT is good for someone who are familiar and have experience with other authoring tools before, and are looking for an authoring tool with more productivity features.

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